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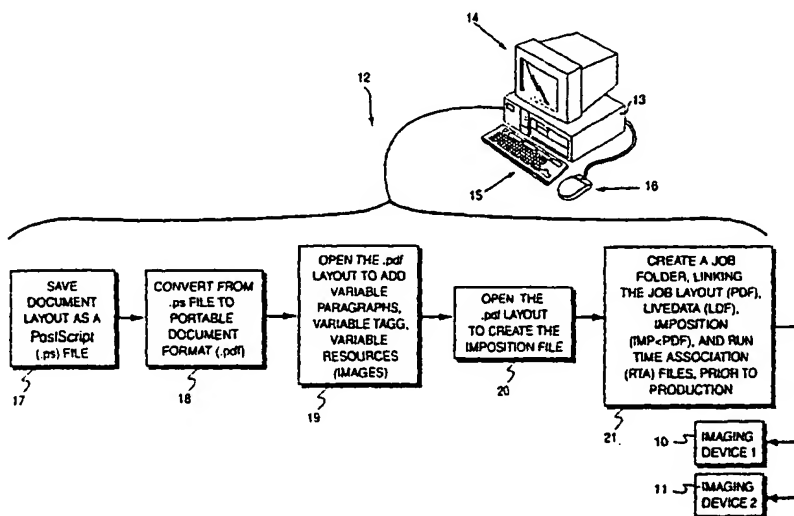
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(57) Abstract: In the production of variable documents, front end software is utilized in a method and apparatus that have a number of advantages in viewing and aiding in the configuration of a variable print job. Variable data is defined in the PDF format which enables variable content to be created and stored above static content. The user can model data bases, position frames, set properties, store states, combine states with logic, and preview merge content. Pages may be repositioned on press sheets specific to supported plant devices, including particular imaging devices. A document may be saved as a .ps file and converted to a .pdf layout. The .pdf layout may then be opened to add at least one of variable paragraphs, variable tags, and variable resources (such as TIFF images, PDF images, and entire PDF pages), and also opened to create an imposition file. A different imposition file can be created from the

## IMAGING DOCUMENTS HAVING STATIC CONTENT AND VARIABLE DATA

### BACKGROUND AND SUMMARY OF THE INVENTION

The production of variable documents containing static content can often be a complex undertaking, especially if a manufacturing installation is utilizing data supplied by a customer to create the appropriate job files in order to properly image the variable documents. While some systems, such as the system used commercially by Moore North America, Inc. of Bannockburn, Illinois, are capable of performing this difficult task, there are a number of limitations. Other systems, such as U.S. patent 5,729,665, store graphic states (attributes and content) and allow one to replace content. The states are taken from static postscript files, stored in an RIP, and let the user merge in data base content at selected states. There is no front end software to view or aid in the configuration of a variable print job, does not allow notification of a user configuring a variable job that something is wrong before it goes to print, and does not allow different printers to use the same layout file.

According to the present invention a method and apparatus are provided for readily producing variable documents containing static content which are particularly advantageous, and can contain all sorts of variable components. Particularly according to the present invention front end software is utilized which enables a user to model data bases, position frames, set properties, store states, combine states with logic, and preview merged content. The invention also allows for pages to be positioned on press sheets specific to supported print devices, reuse layout files with different impositions to get different printed output or reuse the same layout file on a different printing device, and to notify the user configuring a variable job that something is wrong before the job goes to print. According to the invention variable data is defined with the PDF format which enables variable content to be created and stored above static content, and in an efficient and versatile manner. The invention also can be implemented utilizing combinations of conventional software. Also the conventional engine shown in U.S. patent 5,634,064 can be utilized to view documents.

The invention is best described utilizing the following definitions:

--PDF (Portable Document Format) is the native file format of the Adobe Acrobat family of products. The goal of these products is to enable users to easily and reliably

exchange and view electronic documents independent of the environment in which they were created. Documents in this format can be distributed electronically across the web and on a variety of platforms. PDF is a self-contained format that can be viewed, printed or proofed from any major platform and operating system. PDF is flexible, editable and predictable. PDF files are extremely portable, and are quickly become the *de facto* standard for document delivery.

--Variable Paragraph. Provides the mechanism to define and place text and variable tags. Variable paragraphs support multistyled text, as well as a number of placement and alignment options. Variable paragraphs can be rotated anywhere from 0 to 359 degree, without limitation.

--Variable Resource. Provides the mechanism to define and place resources such as TIFF images, PDF images (graphics) and entire PDF pages. Variable resources can be rotated in 90 degree increments.

--Variable Tags/Tag Definition. The tag definition defines variable data information, i.e. record layout. Tags within a variable paragraph mark its placement for printing within text/ Tags can also be associated with a variable resource as a control for image variability. The use of tags on the whole dictates the construction of each page within a document.

--Variable Layers. Defines the relationship between the actual data and the variable elements. Variable Layers are the key to merging the variable elements. Each variable layer determines the combinations of variable components by using tag definitions and specific conditional criteria defined by the user.

--Imposition. Includes functionality to select layout pages and maps them on to press sheets in the correct orientation. It also provides press marks and the ability to rotate the entire press sheet to account for gripper direction. Multiple devices are deployed to print a finished piece. The imposition module manages which press sheet is sent to a given device.

--Device. This plug-in sets state information for each device, including resolution, bits per component and cutoff information.

--Filters. Provides a mechanism for separating content by color and region to the appropriate device. It is also used during make-ready to register all forms on all devices.

--The Adobe Acrobat architecture includes a rich application programming interface that allows software developers to extend its functionality through custom

plug-ins. The combination of the popularity of PDF with the extensibility of Acrobat's Exchange product provides the ideal environment for the invention.

The invention, which will be provided under the trade name XLO Front End (XLOFE), comprises or consists of a collection of custom Acrobat Exchange plug-ins that provide a way to compose variable documents in both the high speed, black and white world, as well as the short run, color printing environment. The XLOFE extends PDF by storing private, user defined variable information. XLOFE incorporates all of the necessary features to create PDF enhanced files seamlessly and easily. A series of configuration tools enables the user to define and identify specific variable elements - and ensures that certain rules and conditions are adhered to during the process. The XLOFE also provides typical layout type tools (i.e. grids, guides, and group move) that provide assistance to the user during the configuration process for placement and overall ease of use.

XLOFE is WYSIWYG, and standard viewing mechanisms (e.g. such as in U.S. patent 5,634,064) allow the user to preview the variable contents during the configuration process. Upon completion, the new PDF file is then passed onto the data system which is responsible for combining the data, performing the conditional logic and generating each customized page based on the front end components stored directly in the PDF file. The front end defines and constructs each of the components required to fully define a variable job.

According to one aspect of the present invention there is provided a method of designing, preparing and printing variable documents containing static content comprising substantially sequentially: (a) Defining variable data in a .pdf layout so that variable content is created and stored above the static content. (b) Opening the .pdf layout and adding at least one of variable paragraphs, variable tags, and variable resources (e.g. graphics). (c) Opening the .pdf layout to create an imposition file. (d) Creating a job folder linking the .pdf layout, imposition file, and a run time association file. And then (e) imaging the variable documents using the job folder on a first imaging device.

The method may further comprise, prior to (a), (a1) saving a document layout as a .ps file; and in this case typically (a) is practiced by converting the .ps file to the .pdf layout.

In the method (c) may be practiced to create different imposition files using the same .pdf layout as is to practice (c) on a second imaging device. Also (a) may be

practiced using an MICR printer, MIDAX printer, and/or XEIKON printer as the imaging device(s). The method may further comprise displaying the imposition file prior to (e) (such as using the engine disclosed in U.S. patent 5,634,064). The imposition file is displayed, and subsequently imaged, based upon criteria defined during the practice of (a).

Typically (b) is practiced to add all of variable paragraphs, variable tags, and variable graphics. That is (b) is typically practiced to add as variable resources at least one of TIFF images, PDF images, and entire PDF pages. Also (b) may be further practiced to rotate variable resources in 90° increments.

While other existing software may be utilized, or specially developed software created, the desired software that may be utilized in the present preferred embodiment (a1) is QUARK XPRESS software, and (a) is preferably practiced using Acrobat Distiller, and (b) and (c) are practiced using Acrobat Exchange.

According to another aspect of the present invention there is provided a method of producing a variable document having static content from a document layout containing variable data in a .ps file, comprising: (a) Converting the .ps file to a .pdf layout. (b) Opening the .pdf layout and adding at least one of variable paragraphs, variable tags, and variable images. (c) Opening the .pdf layout to create an imposition file. And ultimately (d) imaging the variable documents using the job folder on a first imaging device. The details of this method are preferably as described above with respect to the first aspect of the invention.

According to another aspect of the present invention a variable document production system is provided. The system comprises: A first imaging device. A computer including a monitor and input device. A computer control for the first imaging device. And, the computer control comprising front end software accessible by the computer for (i) defining variable data in a .pdf layout including variable content created and stored above static content; (ii) opening the .pdf layout and adding at least one of variable paragraphs, variable tags, and variable images; and (iii) opening the .pdf layout to create an imposition file. And, the computer control, or another computer control using output from the computer control, operates the first imaging device to image documents having static content and variable data.

The system may further comprise a second imaging device of a different type than the first imaging device, and controllable by the computer control using a second imposition file created by the computer control from the same .pdf layout. Typically the

first and second imaging devices are selected from an MICR, MIDAX, and/or XEIKON printer(s): The variable-resources preferably comprise PDF pages, and variable images (graphics), such as TIFF images and/or PDF images.

Preferably the front end software for defining variable data in a .pdf layout  
5 comprises software for saving a document layout as a .ps file, and converting the .ps file to the .pdf layout. For example the front end software comprises QUARK XPRESS for saving a document layout as a .ps file, Acrobat Distiller for converting the .ps file to the .pdf layout, and Acrobat Exchange for opening the .pdf layout and adding all of variable paragraphs, variable tags, and variable images.

10 The invention also comprises apparatus for practicing the methods as described above. Further the invention relates to a variable document having static content, variable images, variable paragraphs, and variable tags produced by the methods described above:

It is the primary object of the present invention to provide a simple and effective  
15 method and apparatus for producing variable documents in a simple and effective manner that has a number of advantages compared to the prior art. This and other objects of the invention will become clear from an inspection of the detailed description of the invention, and from the appended claims.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

20 FIGURE 1 is a schematic block diagram indicating various components of the apparatus according to the present invention, for practicing a method according to the present invention, in the most simplified format;

FIGURES 2A and 2B provide a high level work flow diagram illustrating an exemplary method according to the present invention;

25 FIGURES 3 through 19 are schematic illustrations of exemplary computer screens that may be displayed on a computer monitor when practicing the method of the present invention;

FIGURE 20 is a schematic of a variable resource menu utilized in the practice of the method according to the present invention;

30 FIGURES 21 and 22 are exemplary other screens that are displayed on a computer monitor in the practice of the method according to the present invention;



FIGURES 23 and 24 are exemplary illustrations of the front of a press sheet (page 1 of an imposition file) and the back of a press sheet (page 2 of an imposition file), respectively, for a particular imposition file according to the invention; and

FIGURE 25 is a schematic illustration of an exemplary variable document, having static content, produced according to the present invention.

### **DETAILED DESCRIPTION OF THE DRAWINGS**

FIGURE 1 schematically illustrates an exemplary system according to the present invention, practicing an exemplary method according to the present invention. The system includes at least one imaging device, such as the first imaging device 10, and preferably at least one other imaging device 11. While a wide variety of imaging devices may be utilized according to the present invention, three commercial printers that are particularly suitable for use in the practice of the present invention are an MICR printer or a MIDAX printer, both available from Moore North America, Inc., and a XEIKON printer, which is a top of the line color printer.

The imaging devices 10, 11 are controlled, according to the present invention, by a computer control, shown schematically at 12 in FIGURE 1. The computer control 12 is shown connected up to a piece of computer hardware 13 which includes a microprocessor, and on which some or all of the software components that are utilized as the computer control 12 may be provided. The computer box 13, as typical, has a visual computer monitor 14 operatively connected thereto, as well as one or more input devices, such as the keyboard 15 and/or mouse 16 illustrated schematically in FIGURE 1.

The first method procedure in one aspect of the present invention in providing the computer control for the imaging devices 10, 11, as represented by box 17 in FIGURE 1, comprises saving a document layout as a postscript (.ps) file. The conventional software that is presently considered to be the preferred embodiment for accomplishing the procedure 17 is the QUARK XPRESS software, which is probably the most common application software used by businesses to prepare basic document layouts for variable printing. The QUARK XPRESS software, preferably used to practice the procedure of box 17, is particularly useful with the Macintosh operating system, which is presently perhaps the *de facto* standard in most company prepress and art make-up departments. However while the invention is preferably utilized with a

Macintosh operating system it is to be understood that it can be readily adapted to other operating systems. For example other conventional software that may be utilized to practice the procedures of box 17 include the Adobe Pagemaker, Adobe Illustrator, and Adobe Framemaker.

5           The next desirable procedure according to the present invention, and related software comprising part of the computer control 12, is illustrated by the box 18 in FIGURE 1, namely converting the .ps file to a portable document format (.pdf). Software that is commercially available that is preferably utilized to practice the procedure 18 is Acrobat Distiller software (such as version 3.02).

10           The next procedure according to the invention, utilizing software that is part of the computer control 12, is schematically illustrated by box 19 in FIGURE 1 and comprises opening the .pdf layout to add variable paragraphs, variable tags, and variable resources. Variable resources typically include TIFF images, PDF images, entire PDF pages, and the like. The procedure 19 is preferably practiced utilizing  
15           Acrobat Exchange software (such as version 3.01). That same software is utilized in the practice of procedure 20, which is opening the .pdf layout to create the imposition file. An imposition file is necessary to place page layouts on a press sheet or web of paper in the exact position and orientation in which they will print.

          The procedure/software 17-20 provide front end software according to the  
20           present invention forming part of the computer control 14 for producing variable documents according to the present invention. After the procedures 17-20, as illustrated schematically by box 21 in FIGURE 1, a job folder is created linking the job layout (pdf), live data (ldf), imposition, and run time association (RTA) files prior to production. The procedure 21 is conventional with present variable document  
25           production systems, such as those utilized by Moore North America, Inc. of Bannockburn, Illinois. Ultimately, then, the job is ready for imaging, the particular imaging device 10, or 11 for which the particular job folder is created then being operated to produce the desired variable documents, either by the computer control 13, or a like control hooked up to control 14 or (e.g. via disc, tape, telenet, etc.) receiving  
30           the software from 13 necessary to control printers 10, 11.

          At any time during the procedure, and utilizing the apparatus, of FIGURE 1, the details may be displayed on the monitor 14, such as using the viewing engine of U.S. patent 5,634,064. Advantageously according to the present invention, once the pdf layout has been produced, as well as any variable paragraphs, tags, images, etc.

added thereto, it can be used to create a second imposition file at stage 20, which is specific to the second imaging device 11, so that the same pdf layout may be utilized to print with two or more different imaging devices 10, 11.

FIGURES 2A and 2B provide a more detailed high level flow sheet of a method according to the present invention, utilizing the system of FIGURE 1 according to the present invention, for the production of variable documents.

The starting point, illustrated schematically at 23 in FIGURE 2A, is an initial layout that has been produced and/or approved by the customer requiring the variable documents that are to be produced. A decision is then made, as indicated schematically at decision box 24, as to whether or not custom fonts are required to support the job. If "yes", as indicated schematically at 25, the fonts are created. If "no", or after creation of the custom fonts, as indicated at 26 in FIGURE 2, a job specific font folder is created and the fonts are loaded. One particularly commercially available software package, operable on the Macintosh operating system, that is particularly suited for font building or selection is known as "Suitcase" by Symantec. A screen that may be displayed on a monitor 14 during font selection is illustrated schematically at 27 in FIGURE 3, that screen 27 being selected from the Apple menu that appears for the Macintosh operating system, and appearing on the monitor 14. Any one of the conventional options and fonts illustrated on the screen 27 may be selected (e.g. using mouse 16 or keyboard 15) depending upon a particular job involved.

The next procedure 29 illustrated in FIGURE 2A corresponds to the procedure 17 of FIGURE 1, namely performing creative composition of a document layout as a .ps file, preferably utilizing QUARK XPRESS software, although other software such as earlier described may alternatively be used. Exemplary screens that may be displayed on the monitor 14 in the execution of this procedure are shown schematically at 30, 31, and 32 in FIGURES 4 through 6, respectively. FIGURE 4 is described with respect to a new job, the procedures associated with editing an already existing job being simpler.

The QUARK XPRESS application is opened by selecting the appropriate icon and the new file menu is selected opening up the new document window illustrated by screen 30. (An existing document may instead be opened from the file menu.) In a new document window illustrated by screen 30 a user enters the specification for the pages of the new document being created including:

- Page (size, width, height, orientation)

- Facing pages (check this for even and odd facing pages)
- Column Guides (for more than one column)
- Automatic Text Box (check this for an automatic text box on each new page).

If an existing document was opened the document set-up option is selected from the file menu, which will display the screen 31 (FIGURE 5) on the monitor 14, allowing the user to verify or revise some or all of the specifications.

Once the appropriate specifications have been entered onto the screen 30, the "OK" option 33 is selected, e.g. by clicking on it with mouse 16, and then conventional techniques are utilized to create the document by placing text boxes, graphics boxes, rules, frames, and other elements onto the page as required for the job. An exemplary screen 32 is illustrated in FIGURE 6 that show various text boxes 34, a graphic box 35, rules and frames 36, etc. Of course the illustration in screen 32 in FIGURE 6 is only one of virtually an unlimited number of options that may be provided. Ultimately the document is saved as a .ps file, and procedure 29 (and 17) is completed.

The box 37 in FIGURE 2A is to set .ps printing options to generate .ps files compatible with the system of the invention. That is, this is practiced to configure an appropriate printer, that is one of the imaging devices 10, 11, so that it is properly controlled by the preferred Acrobat software. Procedure 38 in FIGURE 2A is also practiced at this time, and/or contemporaneous with the procedure 29. FIGURES 7, 8, and 9 show exemplary screens 39, 40, and 41, respectively, that may be displayed on the monitor 14 for the implementation of the procedures 37, 38.

On the initial Apple menu one selects the Acrobat printer and from the QUARK XPRESS package open the document to be converted. Then from the file menu the document set-up item is selected to record and verify the document size, and from the file menu the print icon is selected which contains as tabs document, set-up, output, options, and preview. By selecting the set-up tab the screen 39 of FIGURE 7 will be displayed. From this screen the Acrobat Distiller program, in the preferred embodiment of the invention, is selected, as indicated by box 42 in screen 39. Then the page width is verified, the page set-up box 43 is selected, and the format for area in the window that opens has the Acrobat printer selected. The paper size is chosen, as illustrated by the screen 40 in FIGURE 8, which provides a schematic illustration 44 of the document size. The document itself is illustrated by the white area 45 within the colored area 46, and when viewing the screen 40 on the display 14 care must be taken to ensure that

area 46. Also the page and document should be similarly oriented (portrait or landscape).

When the document is properly configured, the button 47 (FIGURE 8) is selected and a window opens allowing the user to configure the settings to create the .pdf document. In the window 41 of FIGURE 9, when it is displayed, the format is set to "postscript job", the postscript level is set to "levels 2 and 3", the data format to "binary", and the font inclusion to "all", as illustrated in FIGURE 9, and the postscript file is ultimately saved, including by selecting the button 48 in FIGURE 9.

By saving the output of FIGURE 9, one completes the procedure 49 illustrated in FIGURE 2A, that is the Acrobat Distiller options are set to allow the generation of proper .pdf files. The document layout in a .ps file is now converted to a .pdf file, as schematically illustrated at 50 in FIGURE 2A. The procedure 50 conversion is preferably carried out using Adobe's Acrobat Distiller software. This is accomplished by opening the Acrobat Distiller application which will illustrate a screen 51 on the monitor 14, as schematically shown in FIGURE 10, which contains information about the conversion including status, size, source, percent read in a progression bar, the page, and any applicable messages. Once a menu is displayed labeled "Distiller" the "job" option is selected, ultimately illustrating the screen 52 of FIGURE 11. The screen 52 illustrates the components and options that are available when the "general" tab 53 is selected. When the "compression" tab 55 is selected, one can check and compress text in line art box, color bit map images, gray scale bit map images, and monochrome bit map images. The boxes that are checked are "compressed text and line art", "down sample set for 72 dpi", and "automatic compression set to medium", and both "monochrome bit map images" boxes are left unchecked.

When the font imbedding tab 55 is selected, one checks the "embedded all fonts" box and does not check the "sub-set fonts" below box. When the tab 56 is selected, the "convert CMYK images to RGB" box is checked, but none of the other boxes are checked, and "unchanged" is selected under the "color conversion" listing. After all of the selections have been made, the "OK" button 57 is selected, and the appropriate postscript file is distilled.

The above procedure is the appropriate one for utilizing a XEIKON color printer as the imaging device 10 to be utilized. However if a MIDAX, or MICA printer, for black and white printing is to be utilized, then the following changes from the previously described settings associated with the screen 52 should be made.

	General	Compatibility: Acrobat 3.0
		Resolution: 300 dpi
	Compression	Uncheck both boxes in
		Monochrome Bitmap Images
5	Font Embedding	Check Embed All Fonts
		Uncheck Subset Fonts
		Below (always!)
	Advanced	Choose Remove Transfer
		Function s and Remove
10		Under Color
		Removal/Black Generation

If at this point the user wants to display and/or print a hard copy of the .pdf file, as indicated by decision box 58 in FIGURE 2A, the Adobe Acrobat reader application is opened which allows viewing and/or printing as illustrated schematically at 59 in FIGURE 2A. The file will look exactly as it was originally created when displayed or printed, and printing may be accomplished using any operating system platform and any printer.

The next procedure in FIGURE 2A, indicated by decision box 60, is to determine whether there is an existing job containing images being reused, and if "yes" then the conversion takes place as indicated at 61 in FIGURE 2A. After the conversion, or if no existing job is being reused, then the .pdf layout will be opened, such as by utilizing Acrobat Exchange, to add variable paragraphs, variable tags, variable images, and ultimately to create an imposition file. This procedure is initiated, as indicated by box 62 in FIGURE 2, by launching the Acrobat Exchange program.

After launching Acrobat Exchange, as indicated by decision box 63 in FIGURE 2A, a determination is made as to whether a reusable record layout file exists for the jobs. If it does then it is converted as illustrated at 64 in FIGURE 2B, and record layout information is imported as illustrated schematically at 65 in FIGURE 2B. After this conversion and importation, or upon a "no" decision from box 63, as indicated by box 66 in FIGURE 2B all the fonts to be used by the job are embedded and then the job configuration is performed as indicated at 67.

When a font is embedded in the job file all the information about the font is added to the .pdf file. This makes manipulation of the file independent of the fonts available on the system that is currently manipulating it. The fonts may be located

either in the system folder of the Macintosh or in an open folder in the Suitcase application.

To embed fonts first one quits all the other applications and then selects the font embed application. This allows the user to embed fonts in the .pdf file instead of having  
5 to retreat all the way back to the original QUIRK XPRESS document.

When the font embed application icon is selected a file menu is displayed, and "embed" is selected from that menu. Then a screen 68 as illustrated in FIGURE 12 is displayed on the monitor 14. The screen 68 is navigated through and the user highlights the pdf file into he or she wants to embed the fonts, once the appropriate font  
10 has been selected the "embed" button 69 is selected and when embedding is completed a window will display telling the user that the process is completed.

The job configuration procedure 67 is then practiced to add the variable tags, paragraphs, and resources opening of the pdf file in Acrobat Exchange (19 in FIGURE 1, part of 67 in FIGURE 2) may be accomplished by dragging the postscript file icon  
15 into the Acrobat Exchange icon in a launching window, or opening an Exchange application under the file menu selecting "open" which displays a scrolling list from which to select the desired file, and selecting the file and clicking on "open".

One exemplary procedure for adding variable paragraphs is as follows:

1. Choose press sheet size from the VImpose menu.  
20 VImpose > press sheet size
2. Select MIDAX letter size in the window that opens.
3. Allow this page to remain blank. Do not place anything on this page that needs to be imaged.

This page will act as a carrier for all the job's variable annotations. This page will  
25 not be imposed.

4. Under the document menu, select insert page.

Document > insert page

This will allow you to browse and select any of the just-distilled .pdf pages for inserting into the layout file.

- 30 5. Insert the first page after page one.
6. Continue as in step 4 until all the .pdf pages that will eventually image have been inserted into the layout document.

7. Copy any needed .xlf graphic images (logos) or scannable fonts (for example, bar codes) to the Macintosh, either through the network or from a floppy disk.

8. If .xlf logos or scannable fonts are going to be converted for this job, launch the *xlf2tif* utility by clicking in the application icon.

9. Choose open from the file menu and browse to find the specific logos or fonts.

5 The *xlf2tif* software will convert the original xlf image into a .tif in the necessary resolution to be placed in the layout or .pdf file.

If additional converted QUARK XPRESS files need to be inserted as additional pages in the layout file, from the document menu illustrated by screen 70 in FIGURE 13, select the "insert page" option 71, which displays the screen 72 in FIGURE 14. On 10 the screen 72 the user scrolls to identify the file and once the file is highlighted as indicated schematically at 73 in FIGURE 14, the "open" button 74 is clicked on opening the window 75 of FIGURE 15. Then the location where the inserted file should be placed is chosen utilizing the options 76; and when appropriate the "OK" button 77 is selected.

15 A similar procedure is provided for inserting variable tags into the .pdf layout. Variable tags are placeholders that define the start positions and lengths of fields in a data file. Every tag requires a unique tag name to identify it from all the other tags in a single record. Tags can have unique or overlapping start positions.

Test data (which can be applied to any tag) represents an example of what will 20 print in that field. If one defined a tag as "first\_name" one can enter "John" in the test data field. When sample data is selected from the VIP display menu, the name "John" will appear on the screen instead of the tag "first\_name."

To define variable tags, the Adobe Exchange document is opened and from the plug-in menus the "variable tag definition" option is selected, resulting in the display of 25 the screen 78 illustrated in FIGURE 16. All the appropriate tags are created utilizing the options selectable from the screen 78 and tags are given names, as indicated schematically at 79 in FIGURE 16. When all the appropriate tags have been created the "done" button 80 is selected using the mouse 16 or keyboard 15.

To place a variable paragraph on a page, with the pdf file open in Adobe 30 Exchange one clicks on the variable paragraph icon in the top menu bar, clicks and holds down the mouse 16 key with the cursor anywhere in the page, and drags and release the mouse to delineate a text frame. The window 81 of FIGURE 17 will open and be displayed on the monitor 14. The variable paragraph frame attributes are then appropriately selected utilizing all of the applicable selections from the screen 81 with



respect to the "font" button 82, when that is selected one chooses the font from the list which displays. The fonts which were embedded previously in the QUARK XPRESS file (ps file) are available in this list. If additional fonts are desired they can be made available within the .pdf file by using the "font embed" application earlier described.

- 5 One can also select the "rotation" button 83 which allows one to rotate 90°, 180°, 270°, or some other degree amount. The rotation point is the upper left hand corner of the text frame. Ultimately the appropriate text is inserted as indicated by the selection of the button 84 in FIGURE 17.

- There are other mechanisms for entering text onto a page too including using the
- 10 frame attributes window, by manual entry in the pdf file by typing in the tag surrounded by chevrons, or by importing a plain task or ASCII file and then defining the embedded tag, by copying plain ASCII text from an existing document with the embedded tag, or by using the "get text from file" box 85 in FIGURE 17.

Variable resources, such as images (graphics), may also be added.

- 15 Variable images used on the XLOpen system driving MIDAX and MICA print devices are required to be single-bit TIFF format.

- During the document design stage, elements of a document are defined as static or variable. In addition, images will be printed with flexography, lithography, or with Moore's Intelligent Imaging technology (MIDAX and/or MICA). All the images that will
- 20 be printed with MIDAX or MICA will have to be transformed from their current state to the single-bit TIFF format. Adobe PhotoShop is the preferred application used to make the conversions. This takes place in three steps, and will usually be carried out in one PhotoShop session.

- A. Convert a color image to grayscale. (Both color images and grayscale
- 25 images use multiple bits-per-pixel).

B. Convert a grayscale image to bitmap.

C. Save the image as a TIFF file

One begins by double-clicking on the PhotoShop icon to open the application.

- FIGURE 18 shows an exemplary screen 86 which allows one to save the file as
- 30 a TIFF file. With a bitmap image loaded select "save" from the file menu, and from the screen 86 select "TIFF" from the drop down menu and illustrated schematically at 87. Then the "save" button 88 is selected and from the TIFF options that are displayed "Macintosh byte Ordering" and "LZW Compression" are selected. Similar procedures may be employed to convert xlf logos to tif resources.

To define a variable resource, one starts with a .ps file document that was saved as a .pdf file, and clicks on the "variable resources" icon from the plug-in icons in the top menu bar. This displays the screen 89 illustrated in FIGURE 19. By manipulating the appropriate boxes and making the appropriate selections for the screen 89 in

5 FIGURE 19 one is able to define the appropriate variable resource including, utilizing the image reference frame check box 90, specify a tag to associate with a variable resource. Also by utilizing the "link image" check box 91 an operator may add a reference (file name) of the image that will print at run time. The image need not be in the layout file. FIGURE 20 is a schematic representation of the entire variable

10 resources menu and sub-menus. Variable layers may also be chosen. Similar to selectable criteria in PC configuration, the operator sets a condition and then associates a specific frame with the condition. The frame can be text or images (a variable paragraph or a variable resource) in any of its already-defined views. The operator provides a name for this association, which is then considered a *layer*.

15 One chooses variable layers from the plug-ins menu that displays the "layer definition" window, illustrated schematically at 92 in FIGURE 21. The window of the screen 92 is divided into three functional areas, conditions, assignments, and layers. One selects and manipulates the appropriate options from the screen 92 in order to define the appropriate letters for the variable resources.

20 After the job configuration procedure 67 is completed, as indicated by box 93 in FIGURE 2B, ORL information is sent to list processing. This may be done directly as indicated by line 94 connected to box 95 for the conversion of a live data file to a normalized format by a data center, or alternatively by the procedures to the right of the box 93 starting with the decision box 96. If the job configuration includes variable

25 images, then they are converted to the appropriate format as earlier described with respect to FIGURE 18 as indicated by box 97. After conversion or if after a "no" decision for decision box 96, it is determined whether the job configuration includes any tag driven images, and if "yes" a run time association (RTA) file 99 is created utilizing conventional techniques. After the recreation of the RTA file, or a "no" selection from

30 decision box 98, pursuant to the decision box 100 of FIGURE 2B it is determined whether the job utilizes any non-standard formats. If "yes" then .ps printer fonts are converted to UNIX printer fonts utilizing conventional techniques as illustrated schematically by box 101 in FIGURE 2, and ultimately via line 102 the data is further processed downstream of the box 95.

As indicated by box 103 in FIGURE 2B (and procedure 20 in FIGURE 1) imposition files are then created. It is necessary to create an imposition to place page layouts on a press sheet or web of paper in the exact position and orientation in which they will print. The VImpose menu is displayed, as schematically illustrated at 104 in

5 FIGURE 22. The various definitions associated with the "imposition" procedure are as follows:

	Imposition	Imposition is the process of arranging individual layout pages on a press sheet or web so the pages will be in proper sequence for printing.
10	Press Sheet	The actual paper being printed on, that is, the potential image area. (For Xeikon, this is the cut-sheet size. For MIDAX or MICA, it is the across-the-web dimension.)
15	Page	A press sheet can have one or many layout pages on it that can be either the same or different.
	Gutters	The horizontal or vertical distance between pages on a press sheet (decimal expression in inches).
	Rows	Number of pages aligned horizontally.
	Columns	Number of pages aligned vertically.
20	Cropmark Offset	The distance from the page edge to where the cropmark starts.

Before starting work to create an imposition file, the .pdf layout file is closed. Then the Adobe Acrobat Exchange application is launched by double clicking on that icon and choosing the "press sheet size" option 105 from the screen 104 (FIGURE 22).

25 Then sequentially the "page size", "gutter", "layout", and "cropmarks" options 106 from FIGURE 22 are selected and the appropriate options are selected and data entered on the screens that open up in response thereto.

The method and system according to the invention require that each printing device must be set up on a separate press sheet. For example, for a one-page job

30 which has both MIDAX and MICA printing on the page, two press sheets have to be set up in the imposition file. There are two different ways to accomplish this requirement:

- *Insert Press Sheet* -- This adds a single, additional press sheet. This may be the choice when working with individual pages that will be placed on separate press sheets.

•*Generate Device Views* -- This adds as many duplicates of the original press sheet as is specified in the *Number of Devices* field. This may be the choice when two or more pages are to be placed on the same press sheet.

An exemplary imposition file is illustrated in FIGURES 23 and 24. FIGURE 23 illustrates the front of a press sheet which is page 1 of the imposition file, and FIGURE 24 illustrates the back of the press sheet of FIGURE 23, which is page 2 of the imposition file. The individual documents in both of the press sheet front and back of FIGURES 23 and 24 are provided in this embodiment by using step-and-repeat procedures.

After the creation of the appropriate imposition file a job file is created as indicated schematically at 21 in FIGURE 1, and as indicated by box 99 and other procedures of FIGURE 2B, and imaging is practiced preferably first as indicated by decision box 107 to determine whether the preprint layer contains any complicated graphics. If it does, then the complicated preprint layer is replaced with a plain white background as indicated at 108 in FIGURE 2B, or with a "no" decision or after the replacement, is indicated by box 109 in FIGURE 2B as indicated by box 109, copied required resources are sent to the resource manager server. Then, ultimately, as indicated by box 110 in FIGURE 2B, an imaging device 10 or 11 is controlled to produce a color or back and white composite proof, and then imaging is practiced and the job run to produce the final variable documents, such as the exemplary document 111 illustrated in FIGURE 25.

As indicated schematically in FIGURE 25, the document 111 includes static content 112, that may be provided at various locations in the document, and may have one or more of variable paragraphs 113, variable images 114, and variable tags which define the locations of the images 113, 114.

Thus it will be seen that according to the present invention a method of utilizing front end software, and a system including front end software, employ variable data using a pdf format which enables variable content to be created and stored above the static content. This also enables the user to model data bases, position frames, set properties, store states, combine states with logic, and preview merged content, and allows for pages to be positioned on press sheets specific supported print devices. The same .pdf file may be utilized to create different imposition files for running on different imaging devices 10, 11, and the invention utilizes conventional software in a simple yet

While the invention has been herein shown and described in what is presently conceived to be the most practical and preferred embodiment thereof it will be apparent to those of ordinary skill in the art that many modifications may be made thereof within the scope of the invention, which scope is to be accorded to the broadest interpretation  
5 of the appended claims so as to encompass all equivalent methods and systems to produce equivalent documents.

**WHAT IS CLAIMED IS:**

1. A method of designing, preparing and printing variable documents containing static content comprising substantially sequentially:
  - (a) defining variable data in a .pdf layout so that variable content is created and stored above the static content;
  - (b) opening the .pdf layout and adding at least one of variable paragraphs, variable tags, and variable resources;
  - (c) opening the .pdf layout to create an imposition file;
  - (d) creating a job folder linking the .pdf layout, imposition file, and a run time association file; and then
  - (e) imaging the variable documents using the job folder on a first imaging device.
2. A method as recited in claim 1 further comprising, prior to (a), (a1) saving a document layout as a .ps file; and wherein (a) is practiced by converting the .ps file to the .pdf layout.
3. A method as recited in claim 2 wherein (c) is practiced to create different imposition files using the same .pdf layout so as to practice (e) on a second imaging device.
4. A method as recited in claim 3 wherein (e) is practiced using an MICR printer, MIDAX printer, or Xeikon printer as the imaging device.
5. A method as recited in claim 3 further comprising displaying the imposition file prior to (e).
6. A method as recited in claim 5 wherein the imposition file is displayed, and subsequently imaged, based upon criteria defined during the practice of (a).
7. A method as recited in claim 1 wherein (b) is practiced to add all of variable paragraphs, variable tags, and variable images.
8. A method as recited in claim 1 wherein (b) is practiced to add as variable resources at least one of TIFF images, PDF images, and entire PDF pages.

9. A method as recited in claim 8 wherein (b) is further practiced to rotate variable resources in 90° increments.

10. A method as recited in claim 1 wherein (c) is practiced to create different imposition files using the same .pdf layout so as to practice (e) on a second imaging device.

11. A method as recited in claim 1 utilizing a computer including a monitor and an input device, and wherein (a)-(c) are practiced by selecting and inputting options and data using the input device and displaying information on the monitor.

12. A method as recited in claim 1 further comprising displaying the imposition file prior to (e).

13. A method as recited in claim 2 wherein (a1) is practiced using QUARK XPRESS software, and wherein (a) is practiced using Acrobat Distiller software, and wherein (b) and (c) are practiced using Acrobat Exchange software.

14. A method of producing a variable document having static content from a document layout containing variable data in a .ps file, comprising:

- (a) converting the .ps file to a .pdf layout;
- (b) opening the .pdf layout and adding at least one of variable paragraphs, variable tags, and variable images;
- (c) opening the .pdf layout to create an imposition file; and ultimately
- (d) imaging the variable documents using the job folder on a first imaging device.

15. A method as recited in claim 14 wherein (c) is practiced to create different imposition files using the same .pdf layout so as to practice (e) on a second imaging device.

16. A method as recited in claim 14 further comprising displaying the imposition file prior to (d).

17. A method as recited in claim 14 wherein (b) is practiced to add as variable resources at least one of TIFF images, PDF images, and entire PDF pages.

18. A method as recited in claim 17 wherein (b) is further practiced to rotate variable resources in 90° increments.

19. A variable document production system comprising:

a first imaging device;

a computer including a monitor and an input device;

a computer control for said first imaging device; and

said computer control comprising front end software accessible by said computer for (i) defining variable data in a .pdf layout including variable content created and stored above static content; (ii) opening the .pdf layout and adding at least one of variable paragraphs, variable tags, and variable images; and (iii) opening the .pdf layout to create an imposition file; and

said computer control, or another computer control using output from said computer control operating said first imaging device to image documents having static content and variable data.

20. A system as recited in claim 19 wherein said imposition file comprises a first imposition file; and further comprising a second imaging device of a different type than said first imaging device, and controllable by said computer control using a second imposition file created by said computer control from said same .pdf layout.

21. A system as recited in claim 20 wherein said first and second imaging devices are selected from an MICR, MIDAX, and Xeikon printers.

22. A system as recited in claim 19 wherein said variable resources comprise PDF pages and variable images.

23. A system as recited in claim 19 wherein said front end software for defining variable data in a .pdf layout comprises software for saving a document layout as a .ps file, and converting the .ps file to said .pdf layout.

24. A system as recited in claim 23 wherein said front end software comprises QUARK XPRESS for saving a document layout as a .ps file, Acrobat Distiller for converting the .ps file to said .pdf layout, and Acrobat Exchange for opening said .pdf layout and adding all of variable paragraphs, variable tags, and variable images.



25. Apparatus for practicing the method of claim 1.
26. Apparatus for practicing the method of claim 14.
27. A variable document having static content, variable images, variable paragraphs, and variable tags produced by the method of claim 1.
28. A variable document having static content, variable images, variable paragraphs, and variable tags produced by the method of claim 14.
29. A press sheet corresponding to an imposition file made according to the method of claim 1.

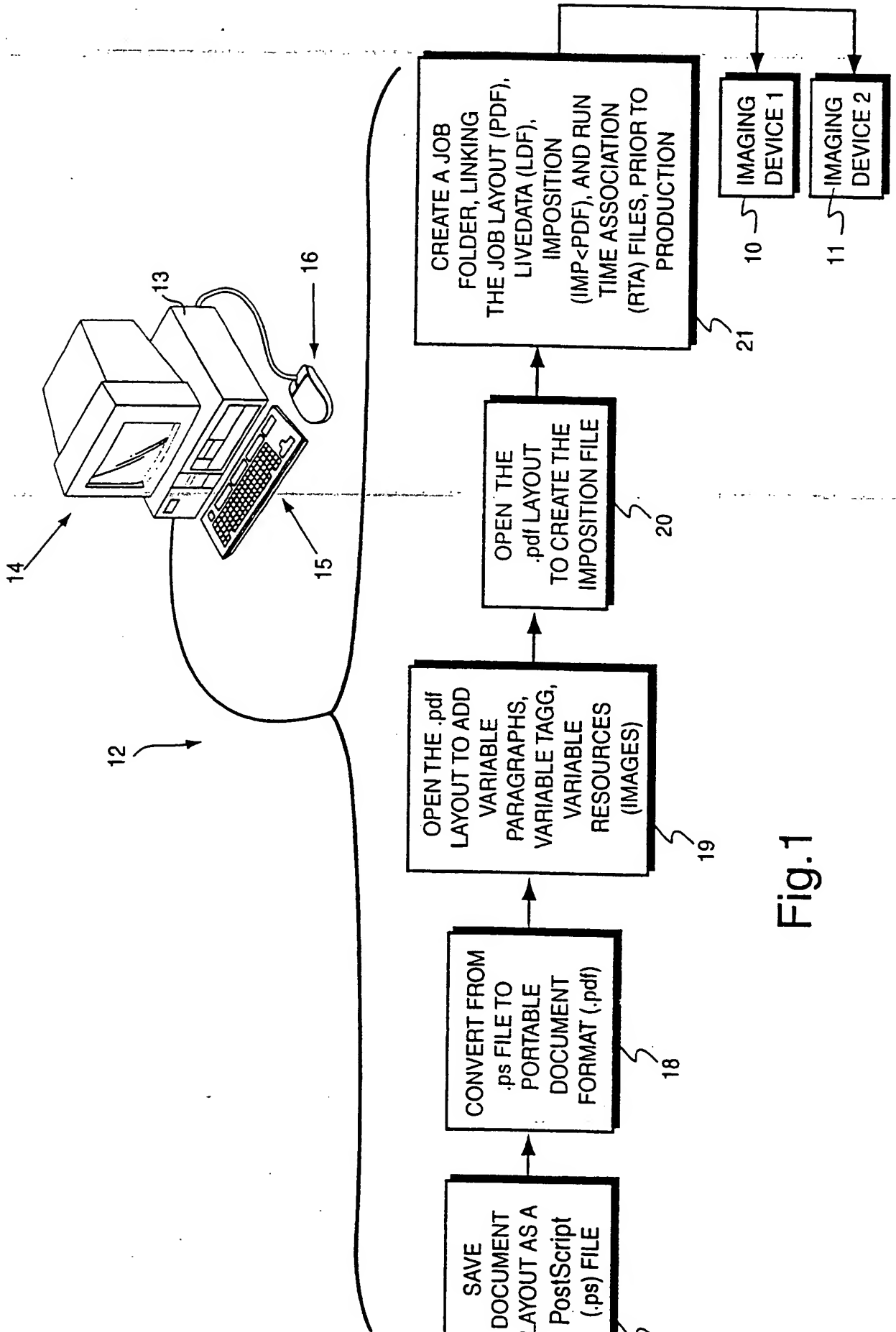
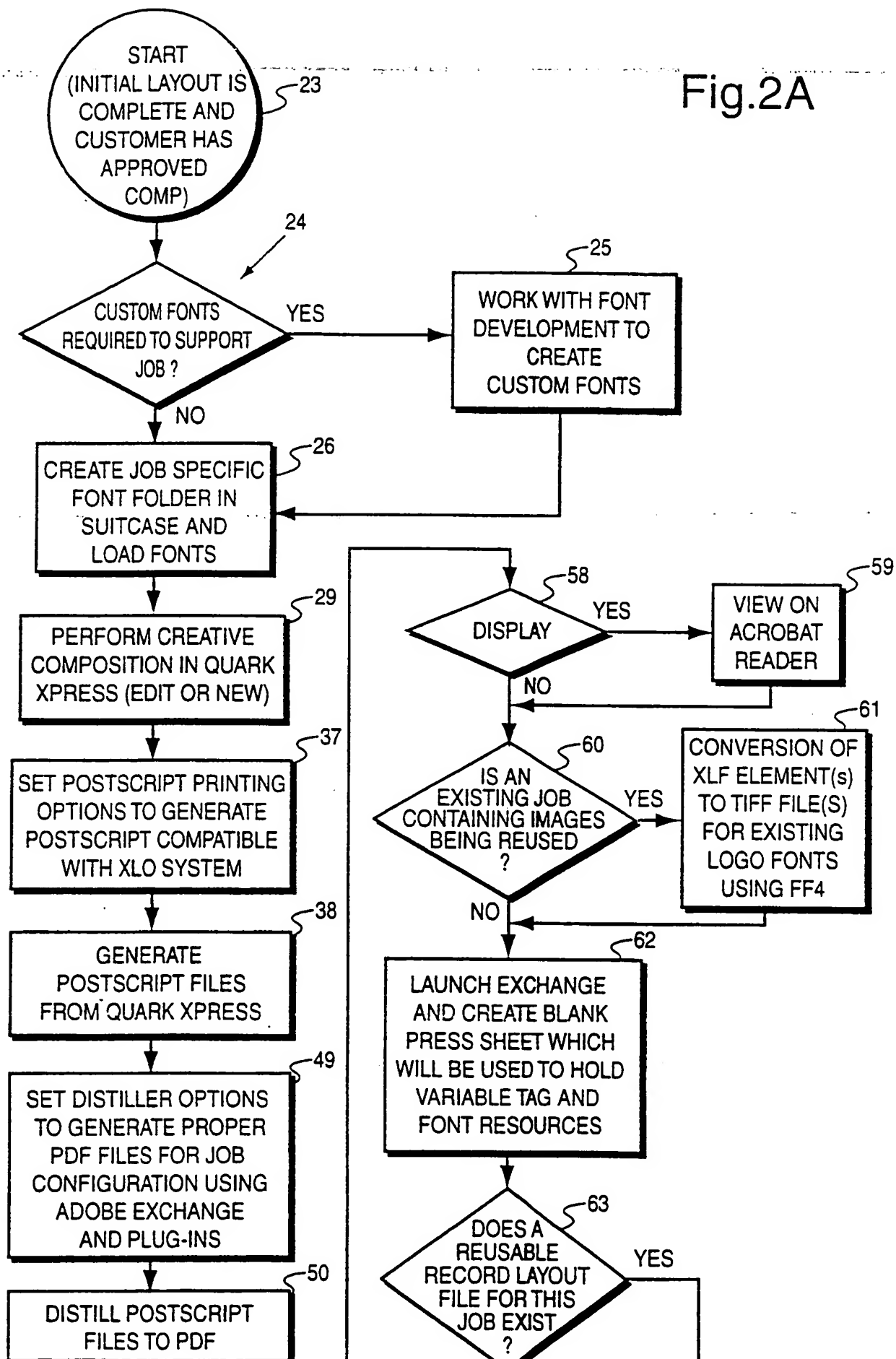
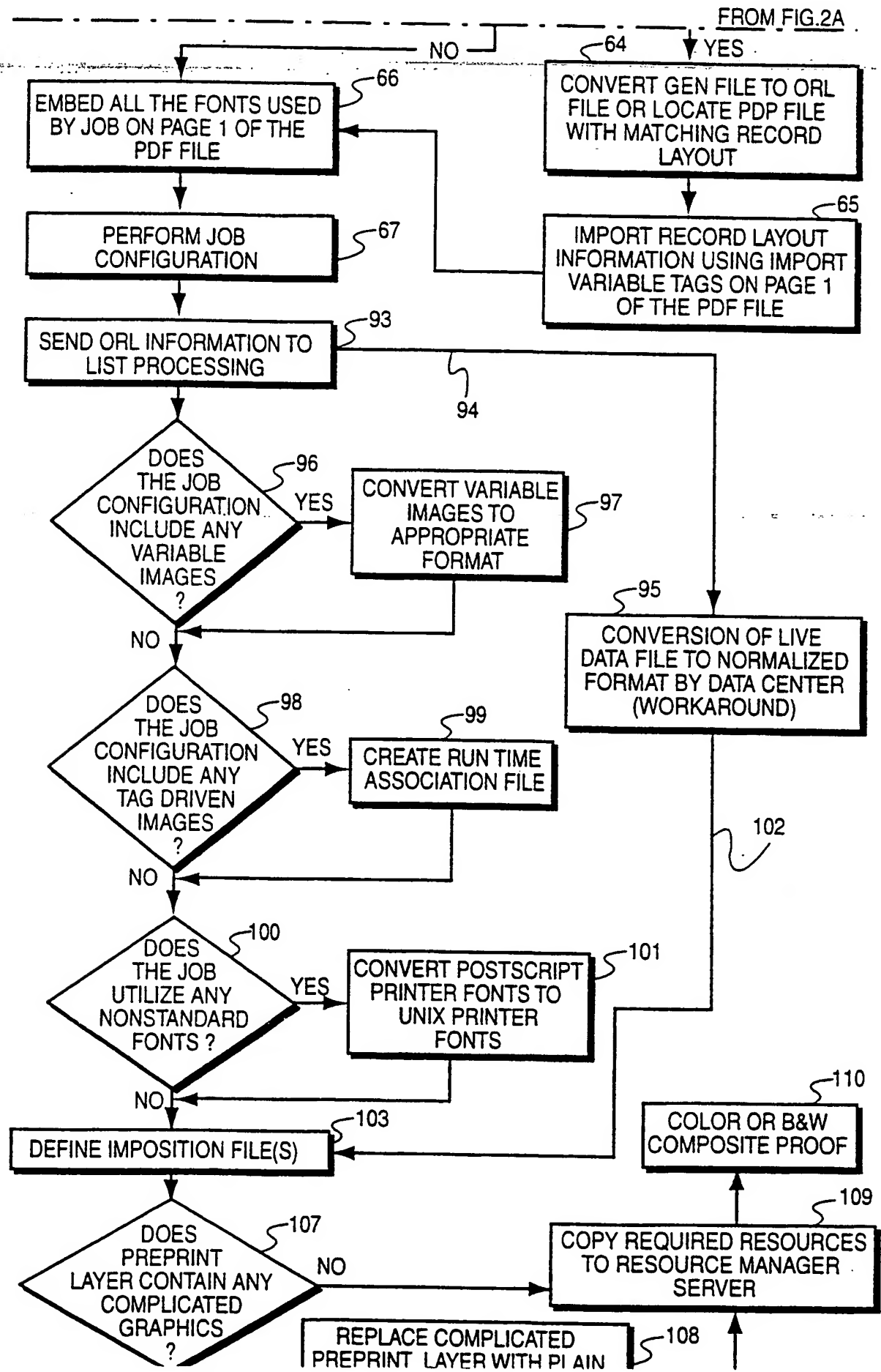


Fig.1

Fig.2A





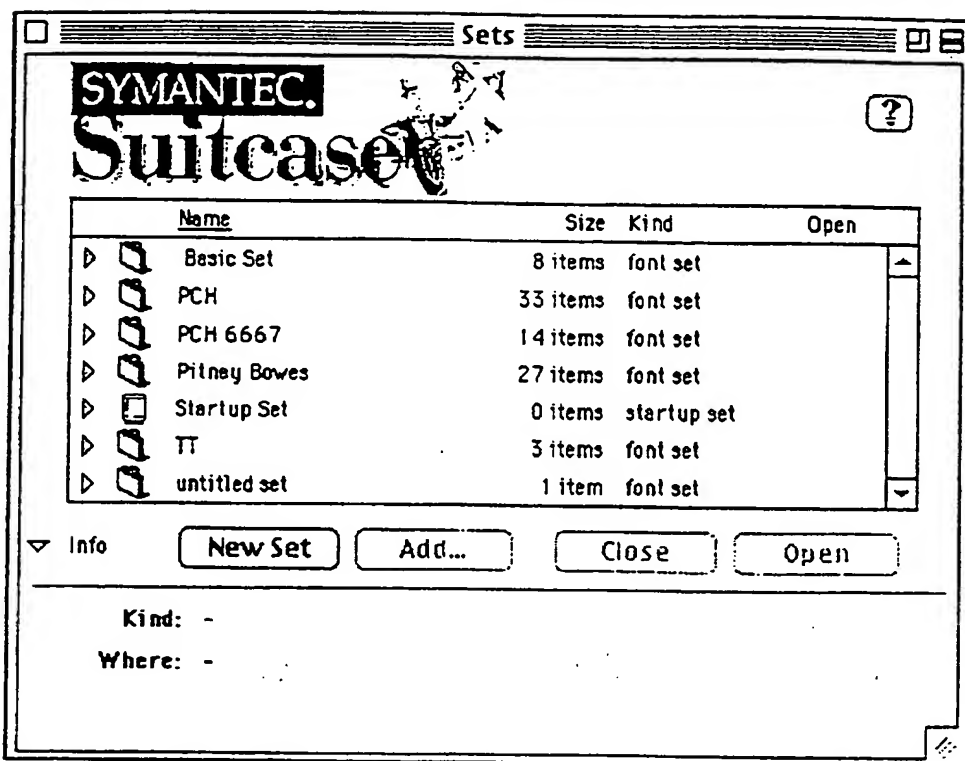


Fig.3

27

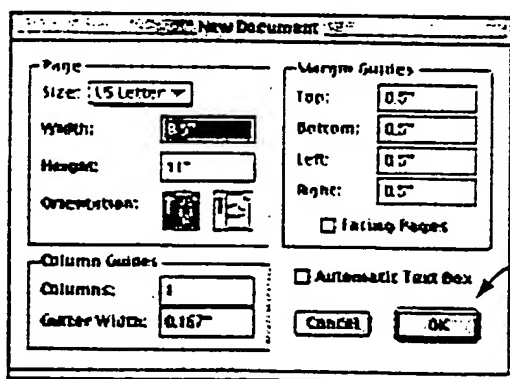


Fig.4

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33

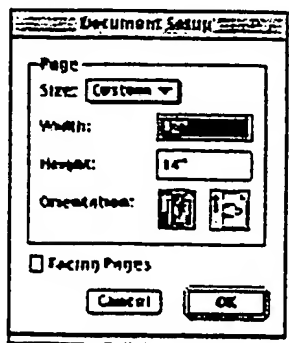


Fig.5

Form 100-1 (Rev. 1-6-65)

PROJECT  
RELEASE NO.  
RELEASE NO.

ALTERNATE NO.  
DATE

CONFIRMING TO

PROJECT  
TITLE

35

36

32

Fig.6

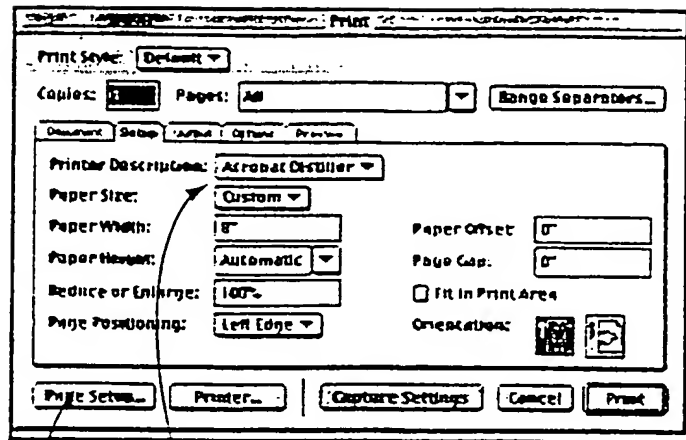


Fig. 7

43 42 39

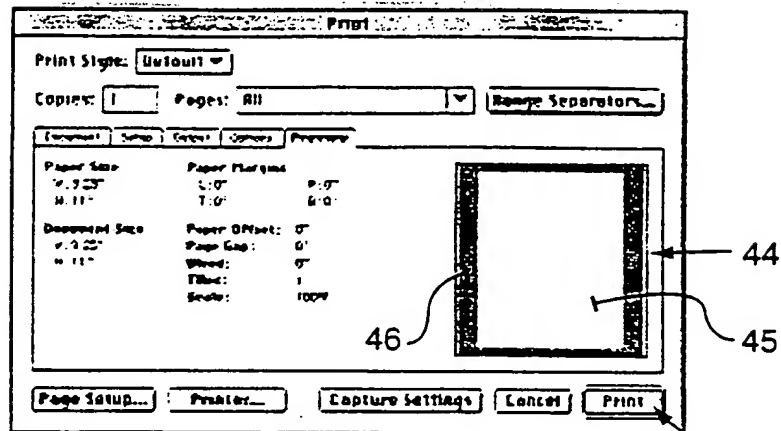
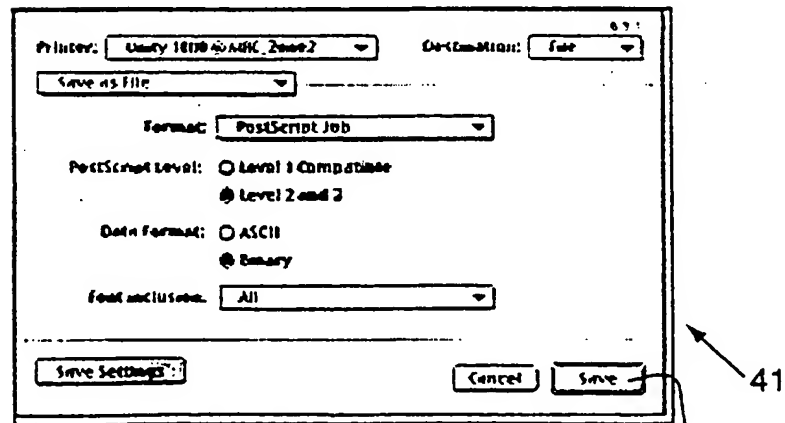


Fig. 8

40 47



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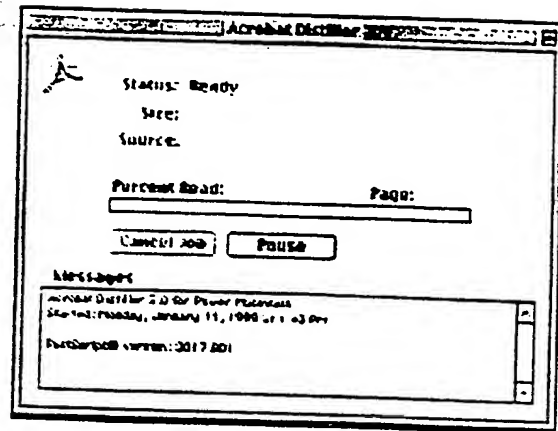


Fig. 10

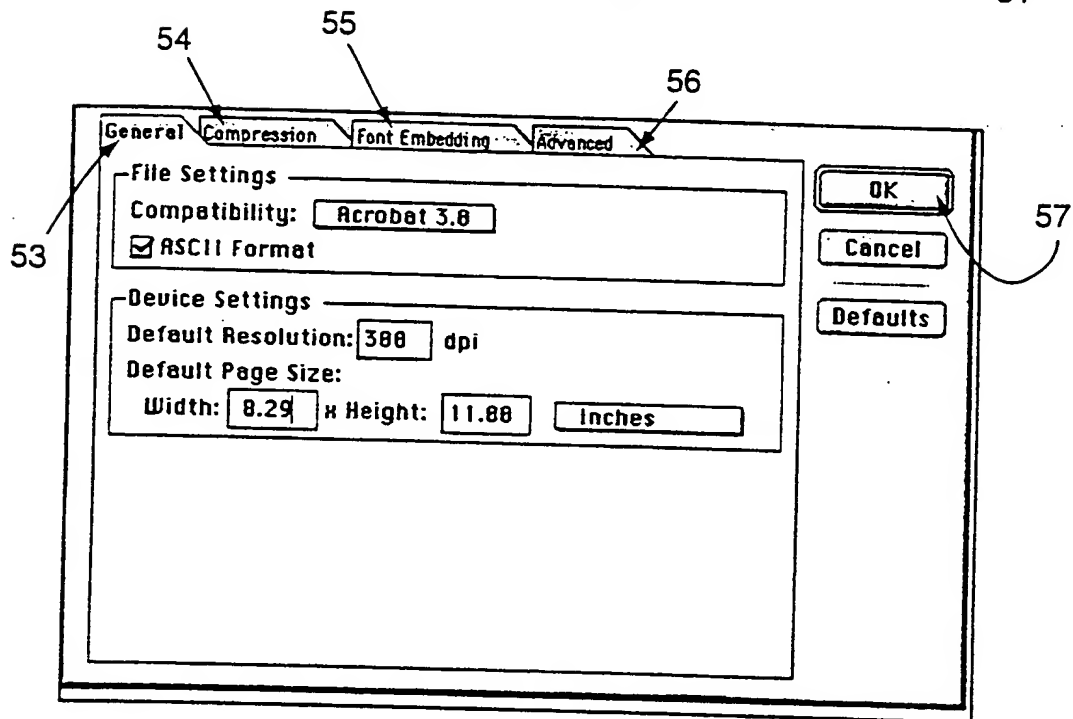


Fig. 11

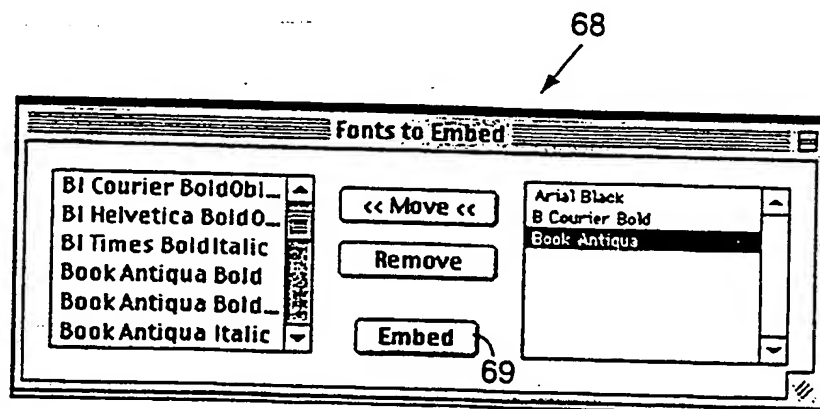
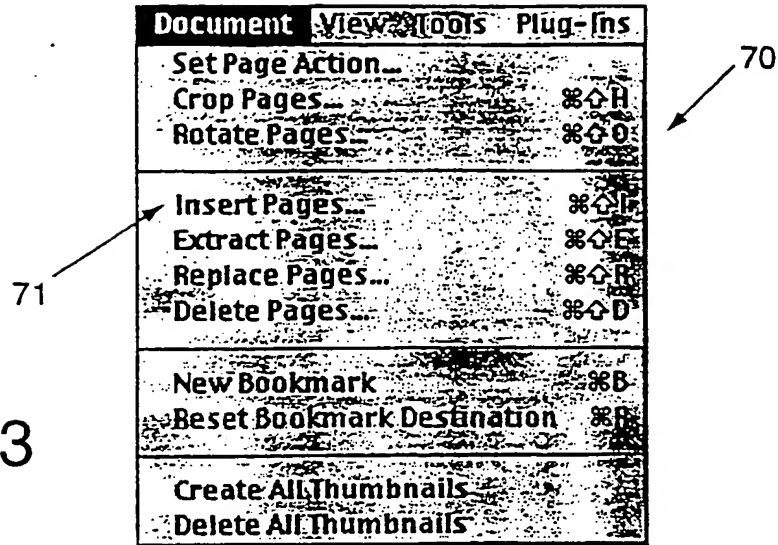




Fig.13



73

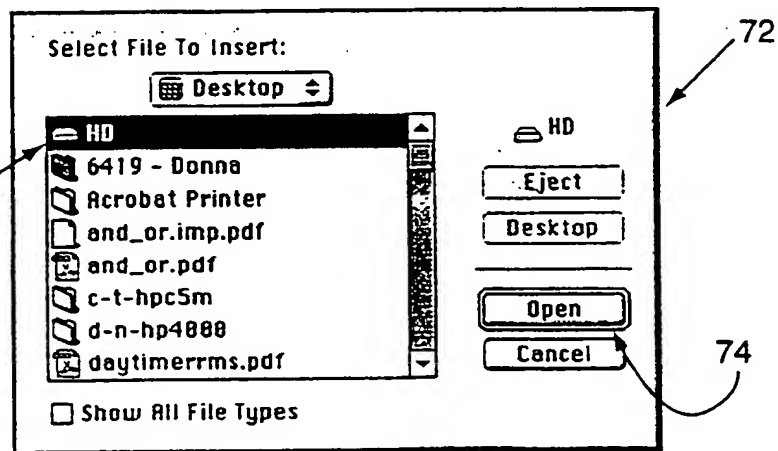
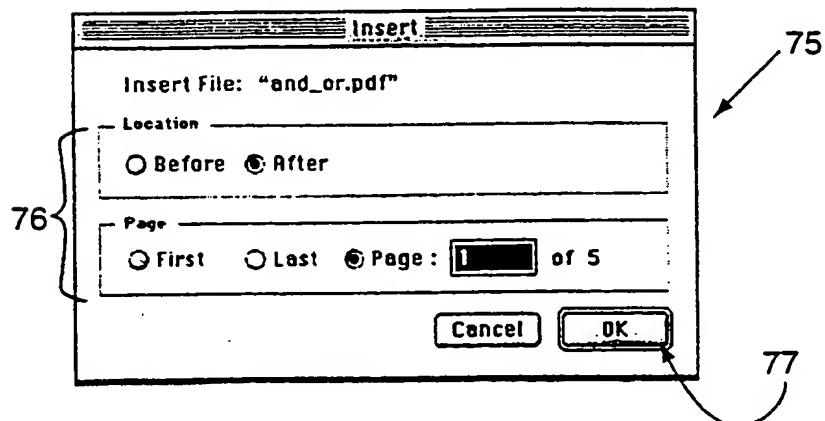


Fig.14



**Variable Tag Definition**

Start	Length	Offset	Use	Tag
1	20	0	20	tag
21	20	0	20	tag1
41	12	0	12	tag2

Record Length:  ☒ Auto Calculate

Tag Name:

Start Position:

Field Length:  ☐ Override Offset/Use

Test Data:

Fill Character: ☐ Translation Table:

End Character: ☐

Buttons: Define, Update, Update All, Insert, Delete, Cancel, Done

Fig.16

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79

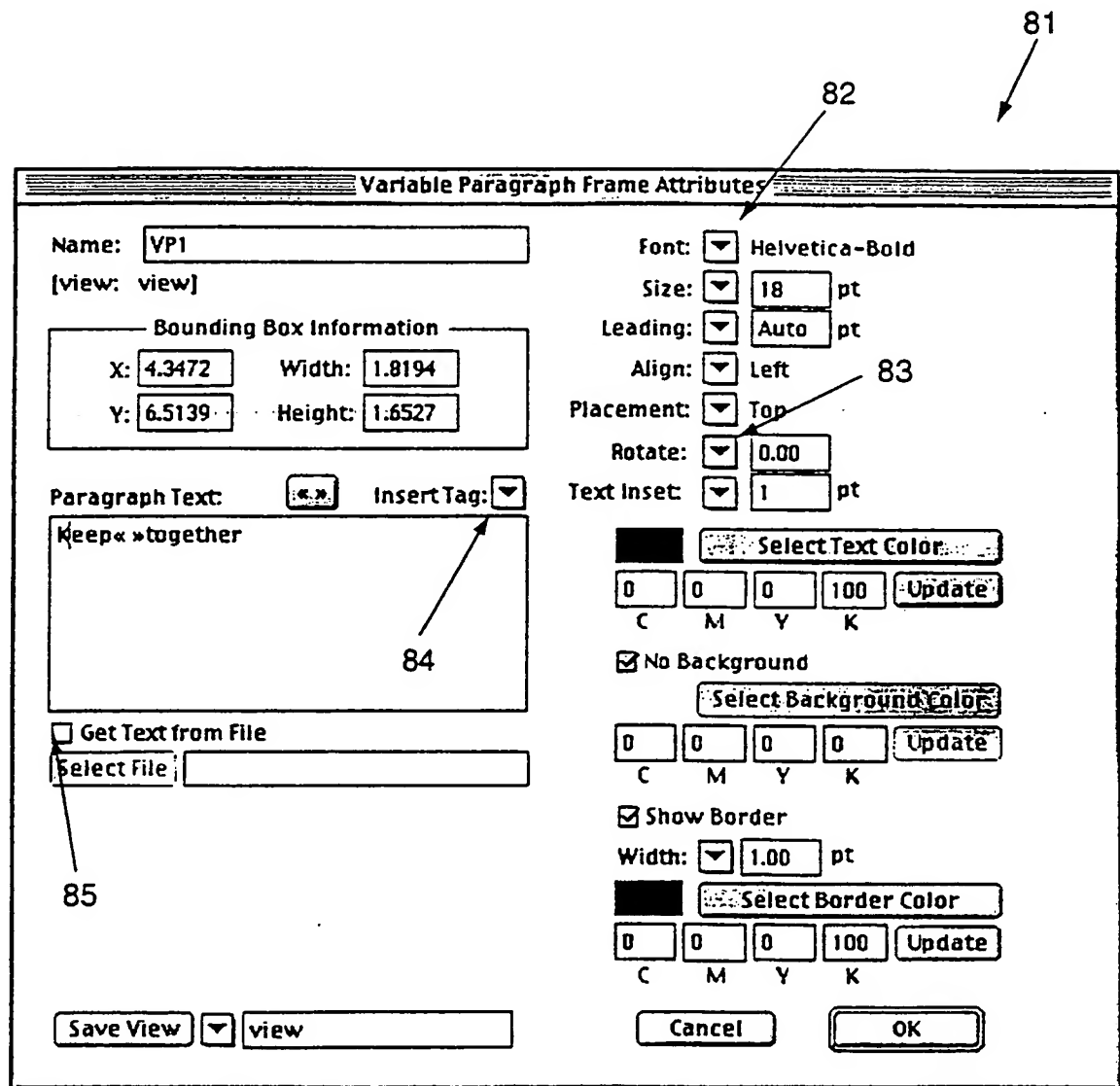


Fig.17

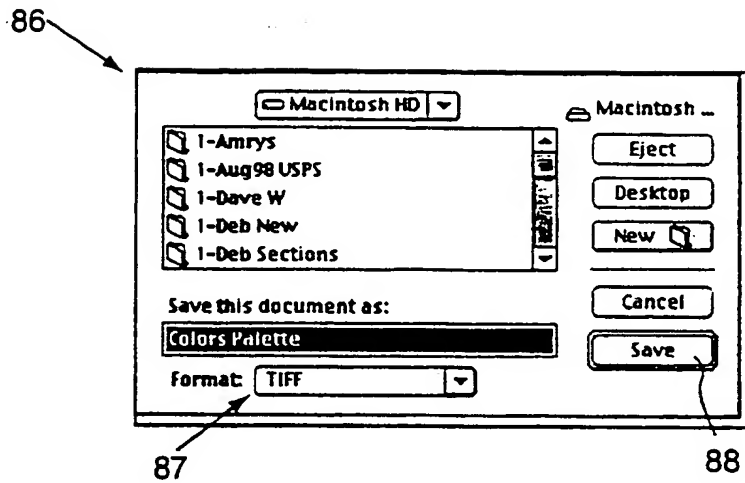


Fig.18

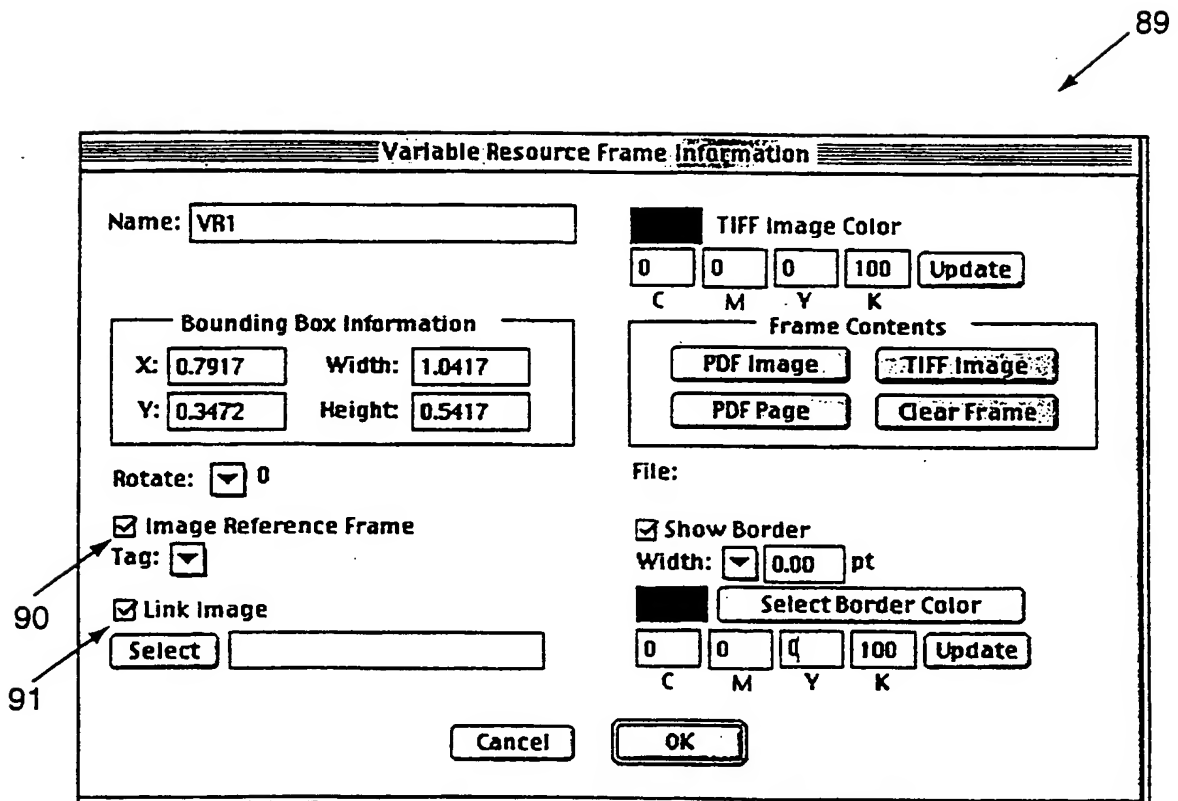


Fig.19

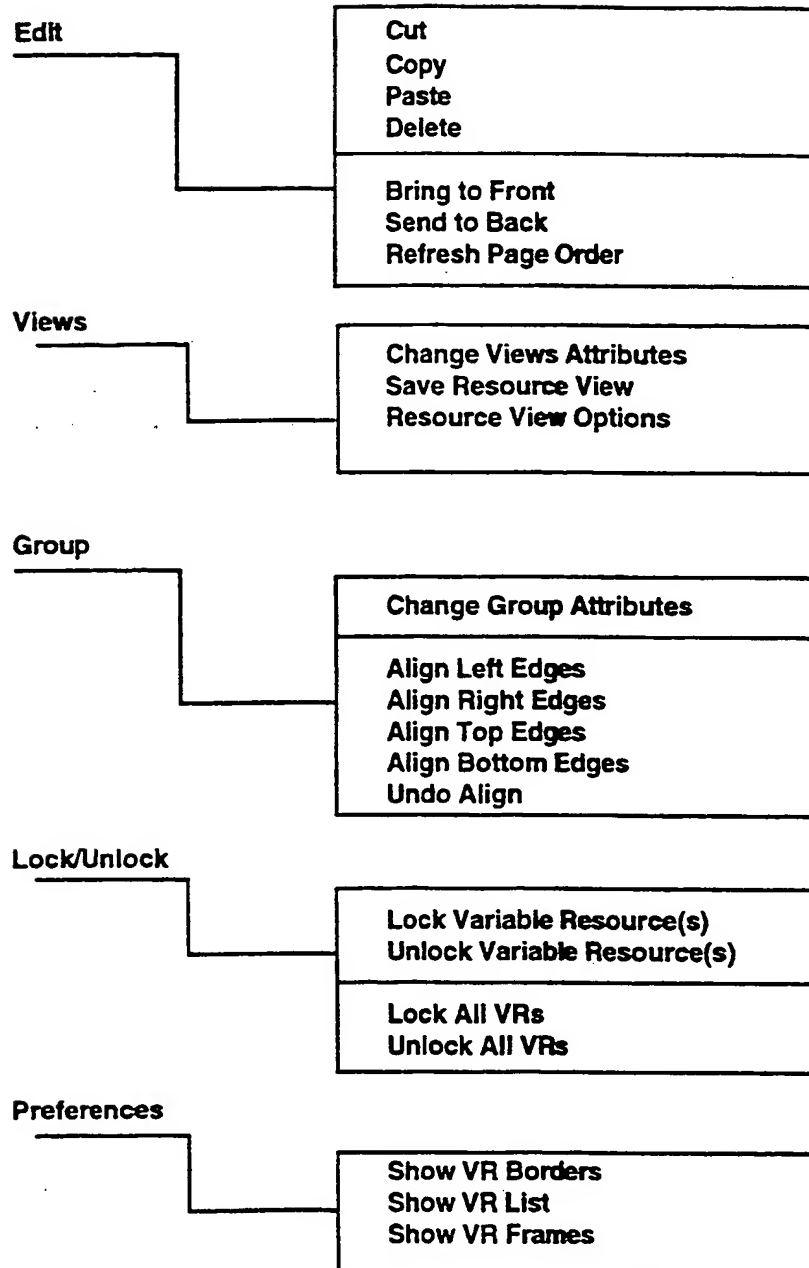


Fig.20

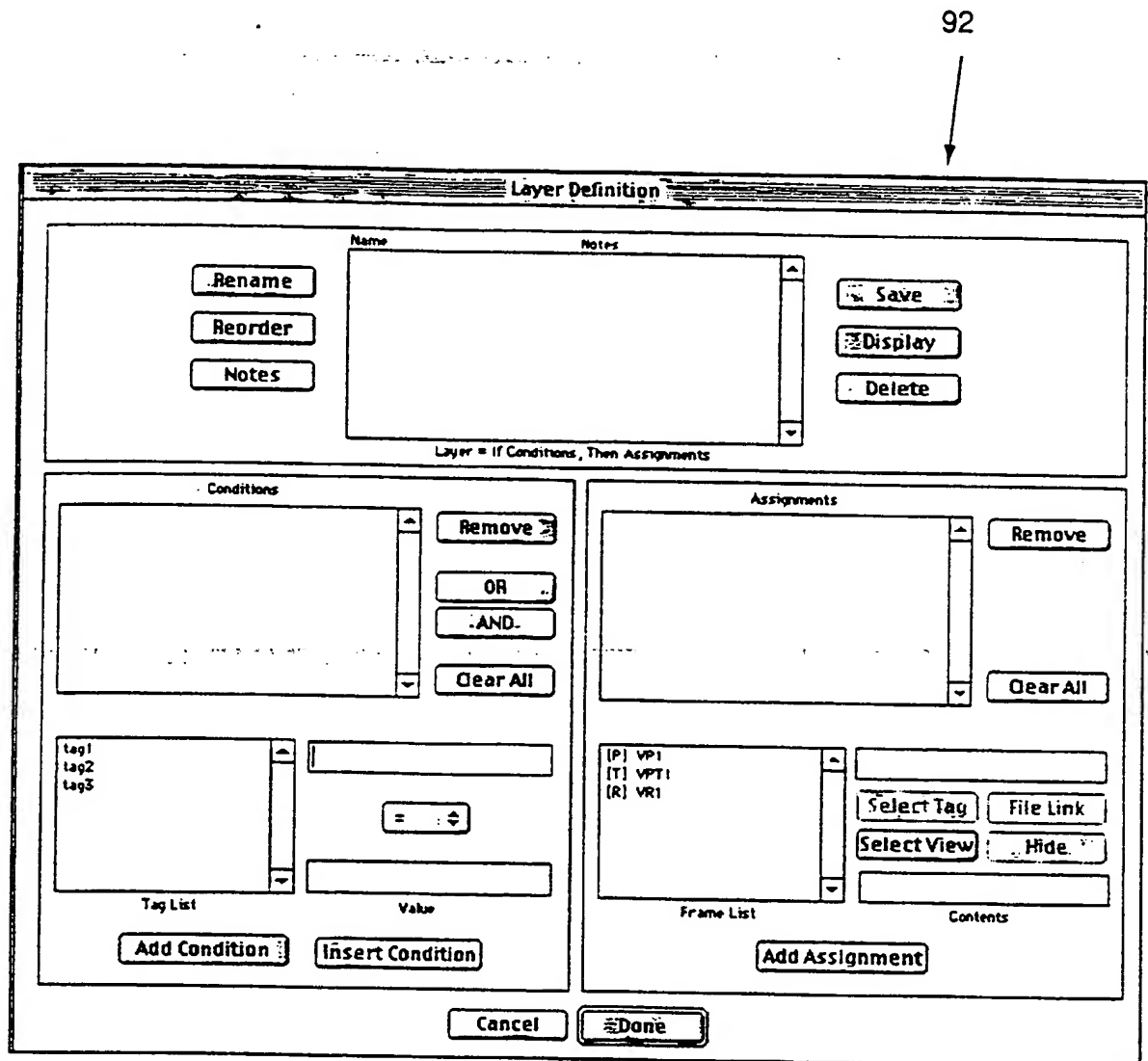


Fig.21

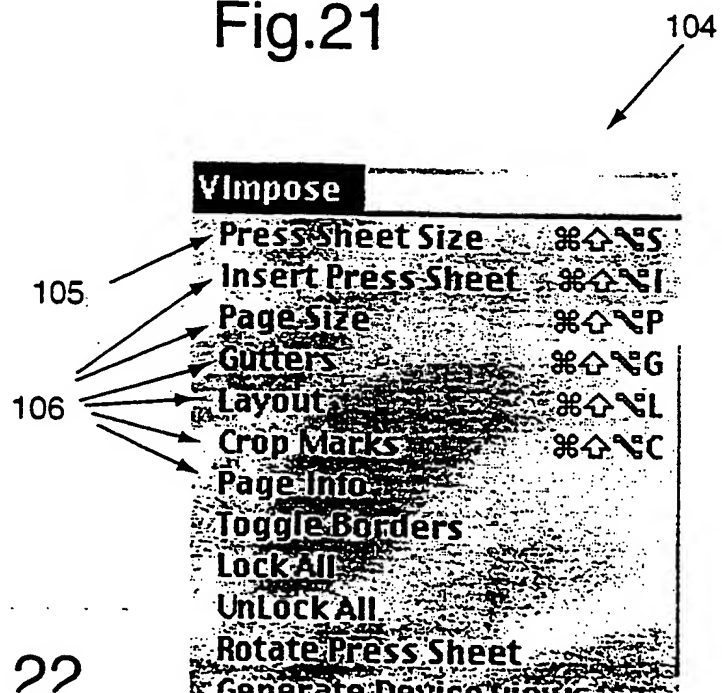


Fig 22

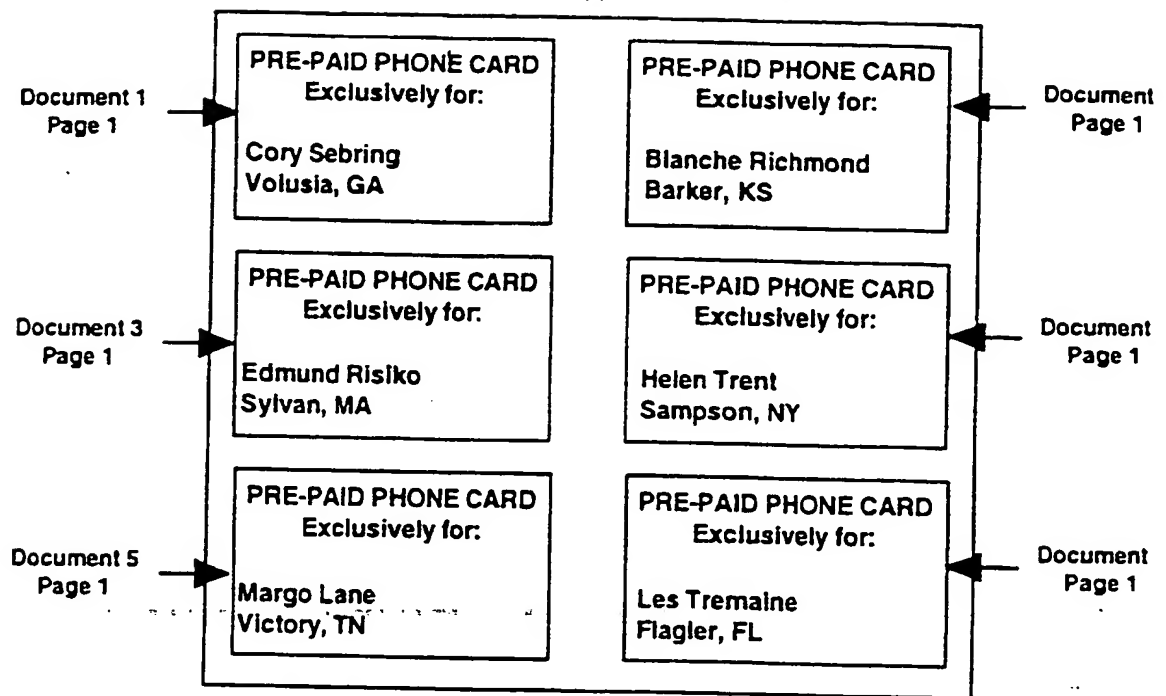


Fig.23

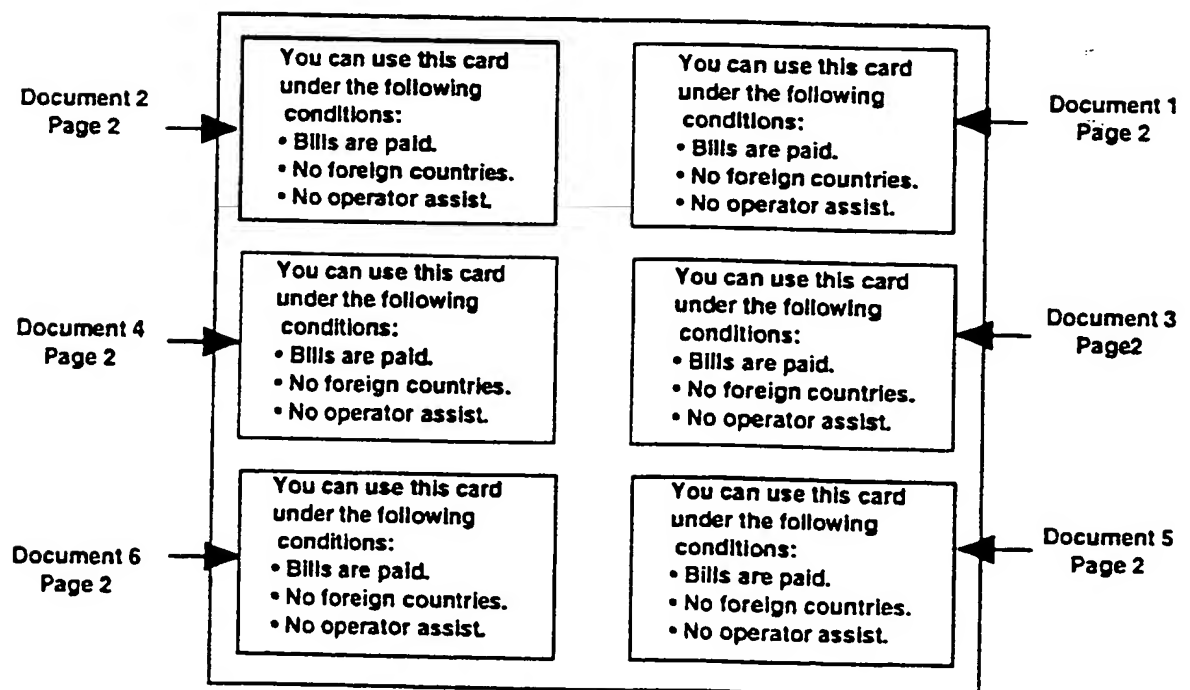


Fig.24

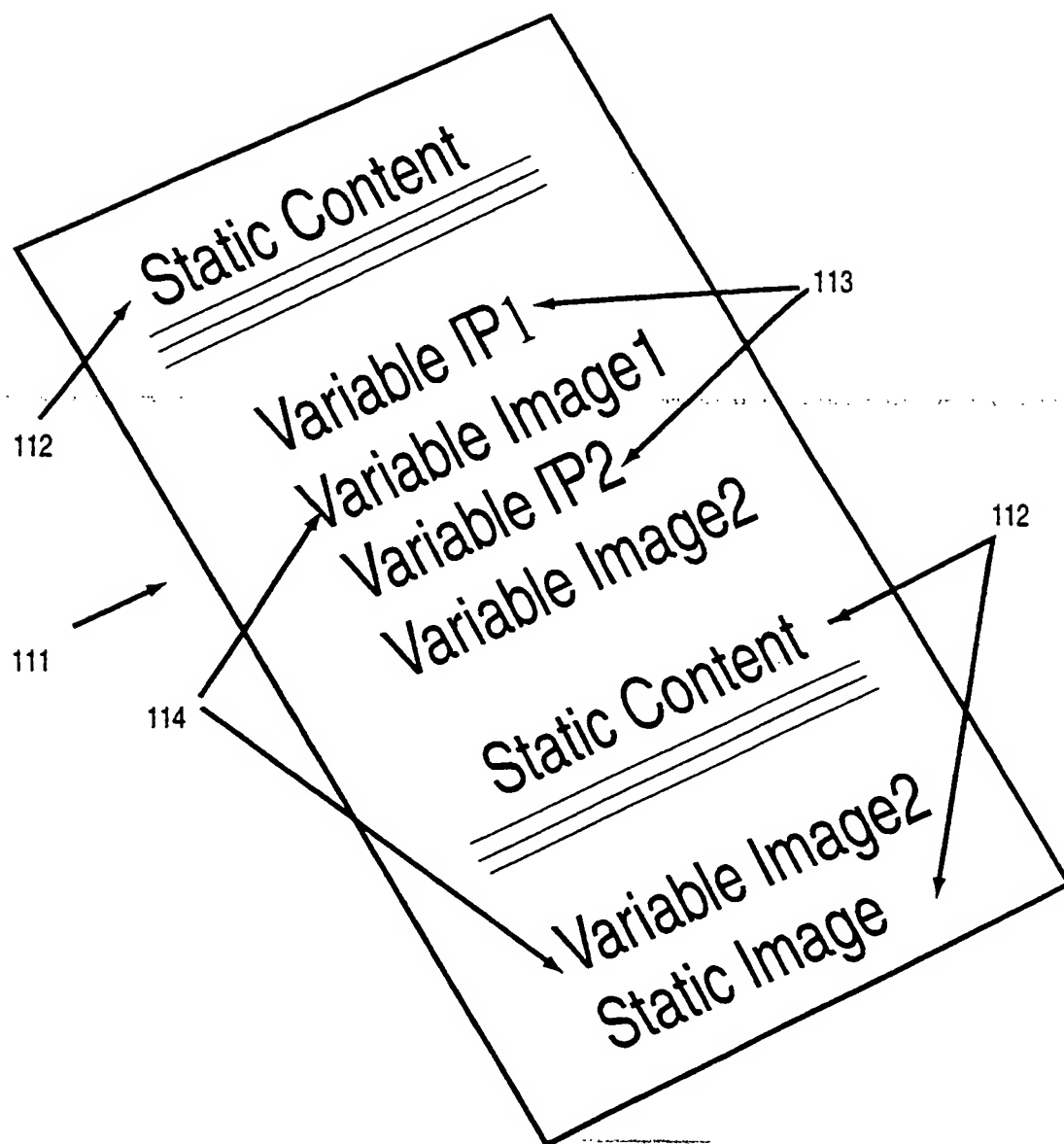


Fig.25



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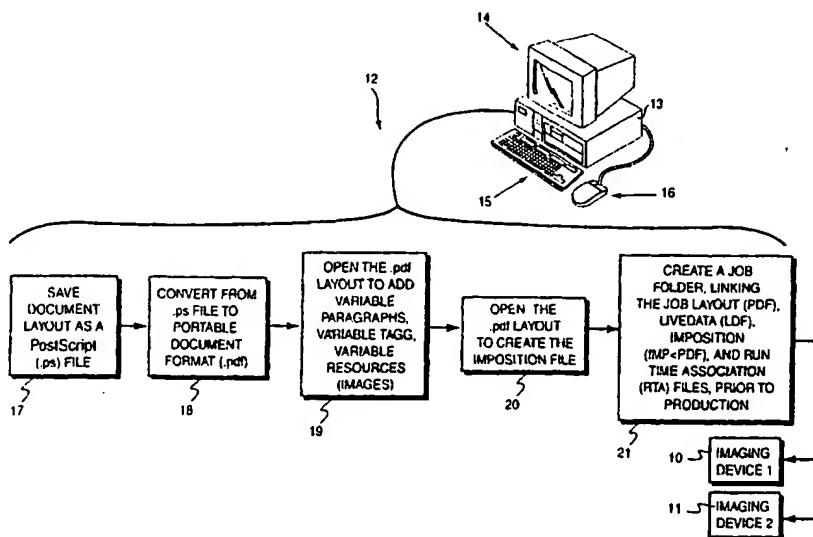
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(54) Title: IMAGING DOCUMENTS HAVING STATIC CONTENT AND VARIABLE DATA



(57) Abstract: In the production of variable documents, front end software is utilized in a method and apparatus that have a number of advantages in viewing and aiding in the configuration of a variable print job. Variable data is defined in the PDF format which enables variable content to be created and stored above static content. The user can model data bases, position frames, set properties, store states, combine states with logic, and preview merge content. Pages may be repositioned on press sheets specific to supported plant devices, including particular imaging devices. A document may be saved as a .ps file and converted to a .pdf layout. The .pdf layout may then be opened to add at least one of variable paragraphs, variable tags, and variable resources (such as TIFF images, PDF images, and entire PDF pages), and also opened to create an imposition file. A different imposition file can be created from the

WO 01/059696 A3



*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## INTERNATIONAL SEARCH REPORT

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## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G06F17/24

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, EPO-Internal, IBM-TDB, INSPEC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 08176 A (MOORE BUSINESS FORMS, INC.) 26 February 1998 (1998-02-26) page 3, line 24 -page 4, line 23 page 6, line 8 -page 7, line 20 page 7, line 28 -page 9, line 5 page 9, line 16 - line 18 ---	1-29
X	WO 99 17359 A (ELECTRONICS FOR IMAGING, INC.) 8 April 1999 (1999-04-08) page 2, line 17 -page 5, line 8 page 9, line 23 -page 10, line 2 ---	1-29
Y	US 5 963 925 A (R. KOLLING ET AL.) 5 October 1999 (1999-10-05) column 9, line 49 -column 10, line 21 column 13, line 13 - line 32 column 16, line 47 -column 19, line 64 --- -/--	1-29

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

16 May 2002

Date of mailing of the international search report

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Tel. (+31) 70 346 0000 Telex 551 000 NL

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## INTERNATIONAL SEARCH REPORT

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PCT/US 01/03664

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